DOCUMENT RESUME

ED 281 447 HE 020 351

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TITLE Hard Cases and Soft Concepts of Change and Leadership in Universities. ASHE 1987 Annual Meeting Paper.
PUB DATE Feb 87
NOTE 50p.; Paper presented at the Annual Meeting of the Association for the Study of Higher Education (San Diego, CA, February 13-17, 1987).
PUB TYPE Viewpoints (120) -- Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Biological Sciences; Case Studies; *Change Strategies; *College Administration; College Admission; College Libraries; College Preparation; Decision Making; Higher Education; *Leadership; *Organizational Change; *Organizational Theories; Population Trends
IDENTIFIERS *ASHE Annual Meeting; *University of California

ABSTRACT

Empirical hypotheses about organizational change are compared with actual case studies of change and leadership at the University of California (UC) system. The hypotheses are based on the sociological literature on complex organizations and are derived from three perspectives: (1) rational choice and analytic approaches, (2) cognitive perspectives, and (3) cybernetic approaches. Rational choice and analytic approaches posit organizational change as an outcome of leadership exercised through planned responses to environmental change, and/or in the management of internal interests through a dominant coalition. Cognitive perspectives view leadership and change as artifacts of the subjective assessment of objectively random events, while cybernetic approaches explain change as the result of the selective action of the environment on organizational "trials and errors." Reorganization of the UC library system, the development of UC's Early Outreach affirmative action programs, and Martin Trow's 1983 study of reorganization of the biological sciences at UC are discussed as examples of organizational change and responses to environmental changes. (SW)

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of Change and Leadership in Universities

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Prepared for presentation at the Annual Meeting
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San Diego, California, February, 1987.

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This paper was presented at the Annual Meeting of the Association for the Study of Higher Education held at the San Diego Hilton in San Diego, California, February 14-17, 1987. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

ABSTRACT

**Hard Cases and Soft Concepts
of Change and Leadership in Universities**

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The purpose of this paper is to show how empirical hypotheses about the process of change in organizations taken from the sociological literature on complex organizations compare with the details of actual cases studies of change and leadership in a research university. The empirical hypotheses examined in the paper are derived from three perspectives: first, rational choice and analytic approaches, which posit organizational change as an outcome of leadership exercised through planned responses to environmental change and/or in the management of internal interest aggregation through a dominant coalition; second, cognitive perspectives, which view leadership, change, and other organizational processes as artifacts of the subjective structure which human minds impose on objectively random events; and last, cybernetic approaches, which explain change as the result of the selective action of the environment on organizational "trials and errors". The data for the paper are recent instances of large scale change in the University of California system.

Application of the case study data to the theoretical constructs indicates that design features which promote sensitivity on the part of organizational decision makers to the fluctuations of a small number of critical variables (such as faculty recruitment and retention rates, and the level of undergraduate preparation) are necessary, and perhaps sufficient, preconditions of successful organizational adaptation to environmental change. In effect, such variables determine the selection among policies generated by either planned or random processes in the organization and its environment.

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Hard Cases and Soft Concepts of Change and Leadership in Universities

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Introduction

The purpose of this paper is to show how empirical hypotheses about the process of change in organizations taken from the sociological literature on complex organizations compare with the details of actual cases of change and leadership in a research university. Many of the general theoretical propositions found in this literature have been subjected to only limited empirical test. Nevertheless they inform much of our understanding of complex organizations, including universities, and support normative prescriptions for administrators. This paper presents work which contributes to the existing empirical grounding in case data for these propositions. The case studies and the theoretical work for this paper have already been completed as part of a larger study of adaptation and design processes in the University of California. Because this paper is intended for conference presentation, it will bring together highlights of several case studies, two of my own and one from the existing literature, in order to compare and contrast some of their most interesting common features with the theoretical constructs.

The empirical hypotheses examined in the paper are derived from three perspectives. These are 1), rational choice and analytic approaches, which posit organizational change as an outcome of leadership exercised through planned responses to environmental change, and/or in the management of internal interests through a dominant

coalition; 2), cognitive perspectives, which view leadership, change, and other organizational processes as artifacts of the subjective structure which human minds impose on objectively random events; and 3), cybernetic approaches, which explain change as the result of the selective action of the environment on a relatively small number of organizational "trials and errors". Such trials are represented either by organizational "genotypes" in a population of organizations or by individual policies within single organizations.

Applied to the problem of describing change and adaptation in universities, each of these perspectives yields a somewhat different set of empirical observations we can expect to make in actual institutions if they provide accurate descriptions of organizational change. These sets of observations are derived deductively from the logic and basic propositions of each perspective. The data for the paper, the case studies against which these expectations are tested, are recent instances of large scale change in the University of California system. The first of these cases concerns the restructuring of the UC library system in reponse to government criticism, rising costs, and dropping enrollments which occurred in the early 1970s. The second is Martin Trow's published study of the reorganization of the biological sciences at UC Berkeley (Change, 1983). The last concerns the University's response to demographic and other changes in the pool of UC eligible high school graduates.

Concepts of Change and Leadership

How is it possible that organizations (or people, or species) change? What is the process by which we adapt ourselves to new environments and intentions? In philosophy, in biology, and in the

social sciences, there are, repeated in different guises, three basic answers to these questions. In a few of these areas of inquiry there is a convergence of evidence and argument on just one of these, the cybernetic. Interestingly, this is not the answer to which we have, until recently, given most of our attention in studies of change and leadership in higher education.

The first answer, the one with which we are most familiar, relies on rationality, analysis and choice for explanation. Usually choice is located in a leading, dominant, or authoritative part of the system, which is seen as making decisions that determine the behavior of the whole. A second, more existentialist, answer recognizes change but sees it as the outcome of random forces divorced from intention and choice. The third answer, least familiar to us and, perhaps for that reason, most interesting, is cybernetic. It understands the behavior of systems as patterns which emerge from the interaction of all the subunits of the system with each other and with the environment.

Gregory Bateson's work on cybernetic explanation is used here as a point of departure for illustrating differences between these three types of explanation. The first answer, relying as it does on choice, decision, and goals for explanation is causal, and

> Causal explanation is usually positive. We say that billiard ball B moved in such and such a direction because billiard ball A hit it at such and such an angle. In contrast to this, cybernetic explanation is always negative. We consider what alternative possibilities could conceivably have occurred and then ask why many of the alternatives were not followed, so that the particular event was one of those few which could in fact, occur. The classical example of this type of explanation is the theory of evolution under natural selection. According to this theory, those organisms which were not both physiologically and environmentally viable could not possibly have lived to reproduce. Therefore, evolution always followed the pathways of viability. As Lewis Carroll has point out, the theory explains quite satifactorily why there are no bread-and-butter flies today (Bateson, 1972: 399).

If we were to observe and try to make sense of a system made up of "a monkey striking a typewriter apparently at random but in fact writing meaningful prose," (p.400) each of the three types of answers to the problem of explaining this system's behavior would direct our attention to very different parts of the system. Perhaps the monkey is smarter, or more capable than we guessed. It is, after all, writing. In other words, this explanation refers to the intelligence of the monkey, and to the monkey's choices as causal agents in the system. The second type of answer, perhaps more convinced of the bounded rationality of primates, says that the monkey <u>is</u> striking the keys at random, but our character as observors is such that we structure the output so as to give it meaning for <u>us</u>. This approach looks for answers in the psychology, cognitive processes, or even culture of the observor. If we are cybernetically inclined, however, we will not necessarily infer intelligence in the monkey, nor look to the observor, because from this third point of view "the course of events is said to be subject to <u>restraints</u>". Thus,

> we shall look for restraints, either inside the monkey or inside the typewriter. Perhaps the monkey could not strike inappropriate letters; perhaps the type bars could not move if improperly struck; perhaps incorrect letters could not survive on the paper. Somewhere there must have been a circuit which could identify error and eliminate it (Bateson: 400).

Our theories of organizational behavior can be sorted into the same three categories: rational/analytic, cognitive, and cybernetic. In the higher education literature Trow's recent interest in and defense of the concept of leadership is consistent with the first approach, March and his colleagues' work on organized anarchies is the best known example of the cognitive approach, and Birnbaum and others' work on the population of higher education organizations is exemplary of the third.

Analytic Models

Rational/analytic approaches are so dominant in our ways of thinking about organizations that, like fish who forget about water, we are scarcely aware that there are alternatives. Analytic models of organization are identified by their shared assumptions, which March and Olsen have expressed simply and concisely as "the preexistence of purpose", "the necessity of consistency", and "the primacy of rationality" (1979:69-70). "Preexistence of purpose" refers to our "strong tendency to believe that a useful interpretation of human behavior involves defining a set of objectives that (a) are prior attributes of the system, and (b) make the observed behavior in some sense intelligent vis-a-vis those objectives." Consistency is the relation of action to these purposes: "In an organization, the structural manifestation of the dictum of consistency is the hierarchy with its obligations of coordination and control. In the individual, the structural manifestation is a set of values that generates a consistent preference ordering." Rationality is the choice and justification of action based on analysis of the relationship between means and ends.

March and Olsen also indicate how pervasive these ideas are, and, consequently, how pervasive are the theories and models of organization which incorporate them:

> Every tool of management decision that is currently a part of management science, operations research, or decision theory assumes the prior existence of a set of consistent goals. Almost the entire structure of micro-economic theory builds on the assumption that there exists a well-defined, stable, and consistent preference ordering. Most theories of individual or organizational choice behavior accept the idea that goals exist and that (in some sense) an individual or organization acts on those goals, choosing from among some alternatives on the basis of available information. Discussions of educational policy, for example, with the emphasis

on goal setting, evaluation, and accountability, are directly in this tradition." (p.71).

If analytic models are true, the intentions and choices of organizational actors are the major determinants of organizational design and behavior, and it is to them that we must look to understand organizational change. Within the analytic paradigm, a major issue is who sets organizational goals: are the choices which determine organizational behavior the product of some process, be it political, consensual, or simply arithmetic, that weighs and aggregates the preferences of the powerful, or are there overarching organizational goals which constrain negotiations among individual actors? The main difference between the analytic theories of design most familiar to us lies in how they answer this question. Bureaucratic models locate organizational goals outside of the organization itself: outcome preferences are given to the organization from "on high". The organization then acts on these goals "mechanically" or even "transparently". In a mediating position between organizational and individual level answers to the problem of organizational goal setting, organizational leaders are seen as brokers who seek to maximize a coalition's return to to the organization while minimizing the side payments demanded by potential coalition members. Finally, resource dependent approaches distinguish themselves from the others by their emphasis on the special interests of the subunits:

> when incorporating strategic choice in a theory of organization, one is recognizing the operation of an essentially political processs in which constraints and opportunities are functions of the power exercised by decision-makers in the light of ideological values (Child, 1972:16).

Towards the macro end of this continuum of analytic theories, organizational goals are identified with survival and growth, with

profit maximization in the case of firms, and with legal-rationality in the case of public organizations. At the micro end of the continuum, the content of goals is much more difficult to identify, but in universities it is often thought to be the disciplinary and professional interests of the faculty. Empirical work on power and budgeting in research universities supports this hypothesis (Pfeffer and Salancik, 1978; Hills and Mahoney, 1978; and Hackman, 1985).

The members of a dominant coalition, as well as the organizational leaders in more traditional analytic theories, are presumed to monitor the environment for threats to their interests, and the relative power of individual members in the coalition depends on their ability to meet such threats in the interests of the whole. Occaisionally, subunits not in the coalition may be those best equipped to meet new threats. In order to gain their services, the dominant coalition must expand its membership, or, at the very least, include the new actors' parochial interests in the set of interests for which it is willing to commit organizational resources. For example, if student demographics change causing enrollments to stall, previously underrepresented student groups and specialists who know how to recruit and retain them should become more influential in the institution, and so be able to garner disproportionate internal resources. As membership in the dominant coalition changes, we expect to observe parallel changes in organizational commitments that match environmental conditions and the interests of those best able to mediate the environment for the organization. In the words of Aldrich and Pfeffer, "by affecting the distribution of influence within organizations, organizational environments come to affect structure and decisions" (1976:89).

Cognitive Models

Cognitive models of organization have empirical roots in cases of decision making characterized by great complexity and ambiguity. One such approach was articulated by Steinbruner (1974) on the basis of a case study of the politics of NATO's multilateral nuclear force. Another, developed by March and his associates, is based on several studies of leadership and decision-making in educational institutions, in particular, American research universities. (Cohen, March and Olsen, 1972; Cohen and March, 1974; and Olsen, 1979).

These theorists emphasize the limits of our ability to process information and the difficulty we have analyzing means-ends chains under conditions of complexity. Since we continue to structure problems, choose among alternatives and act even when rational caluculations are not possible, the analytic "articles of faith" must be doubted.

March and Olsen introduce their summative work in this area as "an attempt to understand how organizations deal with ambiguity -- goals that are unclear, technologies that are imperfectly understood, histories that are difficult to interpret, and participants who wander in and out" (1979:8). Universities are well-known settings for such ambiguity. Their goals tend to be multiple, conflicting and vague. They do not control clearly defined technologies for efficient teaching and research, nor do they seem to have closed technical cores. The nature of authority, participation, and design in such institutions is confusing. What structures behavior in them?

Cybernetic models, discussed below, look to the environment as a source of organizational structure and regulation in the absence of internal constraints, such as the requirements of technology, or

unambiguous organizational goals. In contrast, cognitive approaches are distinguished by their rejection of the environment as a source of regulation and control. March and his colleagues hold that the relationship between organizational action and environmental response is often too loose or too weak to permit rational action or even learning on the basis of experience. When experiential learning is possible, the meaning of the lessons will be shaped by the organization. In fact, such interpretation becomes one of the organization's major functions:

> An organization is not only an instrument, with decision processes related to instrumental, task-directed activities. It is also a set of procedures by which participants arrive at an interpretation of what they (and others) are doing, and who they are.
>
> This view of an organization as a mixture of issues, activities, feelings, and choices, each generated in part from extraneous factors, makes every choice opportunity an ambiguous stimulus. What is being decided is itself to be determined through the course of deciding it (March and Olsen, 1979: 84-5).

Steinbruner rejects the environment as a source of structure on somewhat different grounds. He believes that when a decision situation is too complex, an environmental disturbance may not lend itself to simplification, for example, to decomposition into smaller problems that could be handled one at a time. Psychologists have found that the human mind imposes its own structure on ambiguous information. A whole field of inquiry, cognitive psychology, is concerned, in part, "with separating out the hypothesis that perceptual experience simply reflects directly what happens in the external world from hypotheses ascribing perceptual experience to the information-processing mechanisms of the mind" (1974: 98). For Steinbruner "cognitive theory offers an important supplementary element: an explanation of how structure occurs other than by imposition from the environment" (1974: 123).

Steinbruner develops implications from cognitive theory which can be applied to the study of policy formation and complex decision situations, but for our purposes March and his colleagues come closest to a model of organizational behavior based on the individual participant's psychological and cognitive processing under conditions of ambiguity. In their models, organizations are viewed as arenas in which frequent opportunites for decision making occur. These opportunities are seen as "garbage cans into which various problems and solutions are dumped by participants. ...In a garbage can situation, a decision is an outcome or an interpretation of several relatively independent 'streams' within an organization" (1979: 26).

These "streams" are made up of problems, solutions, participants, and choice opportunities, such as decisions to sign contracts, to hire, to fire, and to spend money. What is most interesting about these streams is their mutual autonomy. Problems and solutions develop separately and may be associated with different and varying other problems, solutions, participants or choice situations over time. Decisions have a decidedly random character.

> Although the streams are not completely independent of each other an organizational choice is a somewhat fortuitous confluence. It is a highly contextual event, depending subtantially on the pattern of flows in the several streams. (1979: 27)

Not surprisingly, an organization like a university which is said to be characterized by garbage can decision processes is called an "organized anarchy."

It is, perhaps, easier to understand the sense of chaos and complexity in multilateral foreign policy making which made cognitive explanations attractive to Steinbruner than it is to understand formal organizations, including universities, as garbage cans and organized

anarchies, even though these concepts do direct our attention to some of their most interesting properties. Organizational systems incorporate boundaries, agreements, rules, procedures, and stable patterns of interaction among participants that every organizational actor can identify. These patterns are not, it turns out, easily explained without reference to individual or organizational goals and/or the environment.

For example, while writing on the question of "the sources of stability in garbage can processes" (1979: 173) March suggests that the most important sources of stability in universities are the same as those used in cybernetic and analytic models: organizational goals such as teaching and research, and resource "flows" such as research grants, legislative appropriations, and enrollments that describe the environment analogously to the way supply and demand curves describe the environment of the firm. For example,

> ...the administrators with whom we talked were quite aware that ... perhaps 90 percent of the public operating budget is determined by the student enrollment and by some standard formulas, that is to say, by implicit tuition charges.

They also note that the dynamics of the flows are such as substantially to restrict presidential influence over the main thrust of the operating budget (pp. 178-79).

As part of their work on strategy formation in universities, Hardy and her colleagues have observed great stability in such essential institutional variables as enrollment growth. They argue persuasively that this stability is not consistent with the randomness of an organized anarchy:

> Were garbage can processes predominant in university decision making, one would not expect stability and patterning, but the reverse: unpredictable, random swings in behavior. Our belief,

> however, is that this randomness is restricted to relatively minor issues, and tends to balance itself out, so that it appears more in the form of random variations around more stable patterns. (Hardy, et.al., 1984:203).

Are there ways to account for these kinds of stable patterns which, at the same time, accommodate the ambiguity and limits on rationality that Cohen, March, and others have documented in their descriptions of leadership in American higher educational institutions?

Cybernetic Models

In addition to invoking cognitive structuring, decision theorists more typically deal with ambiguity that overwhelms the computational capacities of individuals by substituting "adequate" for "best" as a criteria for choice. Nevertheless, such satisficing is usually seen as a strategy which is consistent with the analytic assumptions:

> Citing lack of knowledge and the disinclination to commit large amounts of resources to gain relatively small increases in the desireability of outcomes, [Herbert] Simon portrays 'administrative man' as one who accepts 'what is good enough'. Critics have argued that such a conceptualization hardly departs from the traditional view of decision makers who 'fine tune' their actions so as to extract every possible 'utile'. The strategy of 'satisficing' is actually 'sub-optimization' or 'optimization subject to constraints'. According to the critics, all Simon is really saying is that at some point information becomes so costly as to outweigh any putative advantages to be derived from further search (Metlay, 1976: 17).

But as Metlay goes on to point out,

> Such an interpretation misses the point; it simply replaces one <u>a priori</u> calculation with another. In doing so, it fails to capture the theoretical import of Simon's contribution. Only a binary approach [e.g., a simple choice between satisfactory and unsatisfactory] to decision making can reduce the demands on the administrator sufficiently so that they fall within his computational capacities to handle them.

Cybernetic models substitute simple binary vetoes (restraints) for more complex analysis and comparison of costs and benefits to explain organizational behavior. Because they do, they can be used to negotiate

between the demands of the analytic models' assumptions and the problems of viewing organizations as anarchies.

The simplest and most familiar example of a cybernetic system is the thermostat, which monitors room temperature, controls a heater, and is set to maintain a preferred temperature. If the room temperature drops too far below this setting, the thermostat activates the heater. When the proper temperature is restored, the heater is turned off. Thus the behavior of the heater is the product of an interaction between the temperature setting (the goal of the system) and environmental conditions which affect room temperature. The thermostat illustrates a way in which simple cybernetic systems monitor a limited number of "essential variables" (in this case just one, room temperature) and change their response to the environment (for example, by turning the heater on or off) as that environment impinges on those variables. The combined action of the whole system serves to regulate or stabilize temperature against random environmental disturbance. If the regulator, represented in this example by the heater and the thermostat, was not operating, the value of the system's essential variable (i.e. room temperature) would be entirely determined by the environment.

More complicated cybernetic systems have all the elements of the simple type, plus an additional capacity to "experiment" when the system's routine responses to the environment fail to maintain the system's goals. These experiments can generate entirely new responses to problems of regulation.

Like the thermostat, natural selection is a familiar example of a cybernetic process, this time of the more complicated kind. In biological natural selection individual members of a species represent

individual "experiments" at maintaining essential species goals such as survival under the conditions dictated by their environments. If the individual, the experiment, succeeds, its characteristics and patterns of response will survive as long as it does and they will be passed on to other members of the species through reproduction.

"Population ecology" approaches to organization apply the natural selection metaphor quite literally to the problem of understanding how organizations adapt to their environments and, to a much lesser extent, to the problem of understanding how their individual characteristics promote or hinder this adaptation. The unit of analysis in this literature is an entire population of organizations. Within this population, some organizations succeed and persist, while others fail and disappear from the population. Success depends on the organization's ability to acquire and use resources from the environment. The characteristics of organizations are explained in terms of this environmental selection process.

One of the best known applications of the population ecology approach to postsecondary institutions is Birnbaum's Maintaining Diversity in Higher Education (1983). He develops a typology of institutions analogous to the biologist's classification of species. This enables him to describe changes in the amount of diversity and the distribution of types of institutions in the population of American colleges and universities. Because diversity is held to be one of the strengths of the American higher education system, his findings have important implications for higher education policy making.

When the organization is the unit of analysis (versus a population of organizations), policies become the experiments, the members of the

population, that are subject to selection and possible retention. Formal models of cybernetic systems (Ashby, 1960) show that individual systems (e.g., a single organization) with certain structural characteristics can adapt as well as whole species to unforseen environmental changes through a process of trial and error search which is analogous to natural selection. Briefly, what is required is that one or more subunits in the organization 1) be sensitive to variation in the value of one or more the organizational system's essential variables and 2) have the power to veto, or force change in, the organization's status quo response if the value of the essential variables moves beyond tolerable limits. A system with these structural characteristics is call ultrastable.

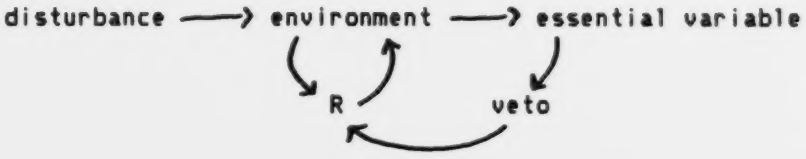

Figure 1: Cybernetic Model of an Adaptive (Ultrastable) System

In such a system, diagrammed in Figure 1, environmental disturbance may disrupt the variables beyond the capacity of the "regulator" (for example, a university's administration) to maintain them. A veto unit with authority of its own (for example, a strong faculty senate, or an individual campus in a federal multi-campus system) will then become active, forcing a trial change in the organization's pattern of response. A series of such trials will be tried until one succeeds in restoring the value of the problem variable, and the veto unit relaxes. (For a more detailed presentation of such models and their application to organizations in general and universities in particular, see

Mock, 1987.) It is worth noting that the simple system represented by the thermostat is distinguished from the adaptive system mainly by the absence of a veto-unit.

If cybernetic models provide accurate descriptions of organizational behavior, we should be able to categorize organizations as simple or adaptive by their structures. (One cybernetically simple type of organization is the bureaucracy.) In the absence of adaptive structures in the organization, the cybernetic approach suggests that organizational change will either be consistent with existing operating procedures, or the result of an intervention from outside (or "above") the organization, which specifies new rules for response. If it has the adaptive structure, change in the organization's essential variables will be a sufficient, and, perhaps, necessary condition for organizational change. If the value of essential variables changes to threaten the organization, then we expect to see some sort of internally generated veto of the organization's routine responses to the environment, and a series of trial restructurings of the organization's behavior until the essential variables restabilize. Organizational behavior in such cases can be described by reference to the values of essential variables, and those characteristics of the environment which impact upon them.

This sort of description differs from analytic and cognitive accounts in that it refers to structural constraints rather than individual characteristics or calculations in explaining organizational behavior. In non-adaptive organizations this difference is not readily apparent, but in cases of internally generated adaptation the difference is striking. The cases which follow describe three instances of organizational

innovation in the wake of environmental change. An analytic interpretation sees the results of adaptation, illustrated in the cases, as the intentional choice of either leadership or dominant internal interests; cognitive models explain them as the outcome of randomly joined "streams"; and cybernetic models explain them as the joint effect of environmental disturbance and an organizational design which corrects error. Table 1 summarizes empirical hypotheses about organizational change that are consistent with each of the three approaches.

Cases of Change

In the main outlines of its structure and behavior, the University of California is typical of the research universities on which most of our models of university governance are based. Indeed, a disproportionately large amount of writing on universities is based on formal and informal observations of this one state system. In some respects, however, the University of California may be atypical of otherwise comparable universities in, for example, its very strong Academic Senate, or in the peculiarities of the state in which it is located. Conclusions based on the case studies here need to be validated in other settings.

Nevertheless, there is no a priori reason to believe that the University of California lends itself more easily to one view of organizational change than another, or that the advantages and disadvantages of the three approaches seen in these cases will not be found elsewhere. Change in the University of California takes place in a context of ambiguity and complexity that offers a strong challenge to analytic models and fertile ground for cognitive approaches. For example, one of March's own case studies of organized anarchy is drawn

from a UC campus (March and Olsen, 1979), but in spite of -- or possibly because of -- the challenge it poses to analytically oriented observors, this university has also been cited as an example of the successful exercise of choice and leadership, not only by Trow, whose case study is one of the three instances of change analyzed here, but by many others, including, for example, Weathersby and Balderston, 1972; McCorkle and Archibald, 1982; and Wittrock, 1982. Cybernetic approaches have not, for the most part, been used to explain behavior in any complex organizations, including universities.

The Malthusian Book Problem

Over the ten years of the 1970s, the University of California undertook an unanticipated -- and unprecedented -- overhaul of its nine campus library system. The effect of the change was to integrate nine separate and, in great measure, autonomous, facilities. The resulting system was different from, and greater than, the sum of its separate parts had been. After the change, the nine libraries were linked by computer and transportation networks, regional facilities were constructed to pool older and infrequently used books, and acquisition and other funding formulae for the whole system had been completly revised. Many of the organizational and technological innovations involved in the change were truly original, both to the university and to library practice altogether.

This reorganization of the UC library system illustrates a case of organizational adaptation in a critical, but clearly defined, functional subunit of the University. The problems faced by the library system turned out to be much more amenable to technological solutions (in particular, automation and its cost savings) than other kinds of issues

in higher education, which may involve demographic and professional change, student achievement, and the procurement and distribution of entire university budgets. Nevertheless, large-scale change, even in the libraries, involved its share of conflict and negotiation. After all, millions of dollars and the largest pooled resource for the core functions of each campus, teaching and research, were at stake. The library issue was, for several years, one of the major points of conflict between the state and the university over budget management. And internally, this change, perhaps more than others, required restructuring an established organizational system which had served the University well for many years. Given the rarity of successful large-scale change, the obstacles they faced, and their eventual success, university officials responsible for the libraries in the 1970s are justified in counting their reforms a major accomplishment of their tenure in office.

Among libraries, the size of the collection as measured by numbers of books and periodicals is the single most important measure used for comparing libraries to each other and for ranking them in terms of their quality. For example, size is the basis for inclusion in the prestigious Association of Research Libraries, and the diversity and size of the library holdings are important considerations in the process by which graduate degree granting institutions themselves are ranked and even accredited. More than alternate measures of circulation and availability, the number of volumes, including periodicals, is widely held to be most closely associated with a library's capacity to support academic programs and research.

Through the 1950s and 1960s university libraries in California grew at a compounded four percent rate. This 4% figure was the basis for university library planning and budgeting, and it seems to have been chosen because it was a) considered adequate to keep up with publishing output, and b) the average growth rate of the libraries with which the UC libraries compared themselves. As new campuses were added to the system in the 1960s, special allocations were added to the budget to start new campus collections. It was anticipated that once these were established, the new libraries, like the older ones, would grow at the four percent rate. The primary policy-making unit of this "system" was a Library Council made up of the University librarians from each campus. The Council reported to the Academic Vice President (Systemwide) and consulted regularly with faculty through the Academic Senate Library Committee and with library staff through the Librarians Association of the University (LAUC). It met just twice a year.

In 1970 three developments, all outside of the control of the University, combined to overwhelm the Library Council and render its operating premises obsolete. First, increases in publishing output and in book and journal prices began to tax even the wealthiest library's capacity to maintain comprehensive collections. In most libraries serious slippage began to occur around 1970. Second, enrollments in the University dropped suddenly and quite unexpectedly, so that the future of the new campuses became uncertain. Third, change in State support of the University was made manifest at the beginning of Governor Reagan's second term. For the first time new budget cuts were not compensated by new fees and hostile audits were authorized, among them a state Department of Finance audit of UC library operations. One result of

these audits was a state demand that all new book acquisitions be justified in a new University library plan. This demand was given teeth by a state-initiated freeze on the acquisition portion of the library budget.

Each of these developments represented a dramatic change in an environmental variable which the library system and the University as a whole had taken to be constant: state support, rapid enrollment growth, and the success of the centuries old practice of securing access to research materials through the comprehensive local collection. The stability of all three had been basic assumptions of library policy.

At first, the university more or less ignored the threat to its libraries, but in 1972, the year the first state audit was published, the central administration established its first ad hoc committee to study library policy. It reaffirmed the policies of the existing system: "the acquisition and maintenance of collections on all campuses adequate to support authorized instructional programs," and "maintenance and improvement of the Berkeley and Los Angeles libraries as Universitywide resources" (UC, 1977:20), and added a third, "Improvement of access and exhange of library materials among the University's libraries."

When it came to acquisitions Berkeley and UCLA dominated. The committee recommended that "the Berkeley and Los Angeles libraries should be allowed to grow at an annual rate of at least 4 percent, regardless of the impact of this policy on the other libraries." (UC, 1977). The other campuses quickly calculated that at current levels of funding their own acquisitions "could be reduced to obviously impossible levels, averaging less than 20,000 volumes per campus

annually." (UC, 1977). This lack of "a systems approach to library planning" was enough to permanently table the report.

A second ad hoc committee was appointed in 1973 to deal specifically with the worsening acquisition problem. Its report suffered a fate similar to the first committee's for similar reasons. While the second committee raised questions about the ways in which acquisitions might be redistributed among the campuses, in the end both committees' approaches were extremely conservative. They took as fixed the concept of a "system" made up of nine independent libraries oriented toward the traditional system's standards of quality: Berkeley, UCLA, and the comprehensive campus collection. Given cost constraints, the consequences for acquisitions in the system as a whole, which would result from trying to preserve comprehensiveness on two campuses, were not satisfactory to the rest of the campuses or to the central administration.

However, even if their conservative, incremental recommendations had been acceptable, the early committees had no authority to provide a trial restructuring of any kind of either the decision premises or the governance of the library system. All the standard operating committees continued to meet and continued to exercise their customary authority over library policy. Meanwhile acquisitions had dropped from 739,000 volumes in 1969 to 523,000 in 1974. Only after two years of limited and unsuccessful attempts to address its problems was the University ready to risk a true restructuring of its library policy and goals.

In order to recast library policy it proved necessary to replace the current operating structure with one less bound to existing assumptions and more committed to and capable of change. The first step

in this direction was the formation of a task force made up of the highest academic administrators from each campus, the Academic Vice Chancellors, in 1974. It was chaired by the Academic Vice President of the whole university. If agreed, the members of this committee would be able not only to recommend change, but would also be able to secure much of the cooperation and consent needed to take their recommendation seriously. In organizational terms, this task force represented an elevation of responsibility for remedying library problems from ad hoc advisory committees that had no formal authority for the library system and no relationship to library policy makers, to a committee of those campus and systemwide officers who had primary jurisdiction over the libraries, to whom the librarians most frequently reported. In addition, these people were those most directly concerned with the effects declining library quality could have on the quality of faculty and programs, since they all had line authority for all three of these aspects of academic affairs.

The result of their deliberations was a four page report which set out "guiding principles" for a new library plan. Although quite general, these principles actually did become the basis of subsequent planning efforts. The first of these principles was the idea that "the library holdings of all the campuses should be considered as a single University collection rather than nine separate collections." A second was commitment to finding a formula approach to acquisitions which would link library development to program planning and guarantee that individual campuses would have collections "fully adequate to support the programs of instruction and research approved for the campus." Last, the Task Force recommended that "the University collection be

organized into [two] regional systems" along North-South lines (UC, 1977).

On the strength of these recommendations, the university president reorganized the Task Force so that it would be able to develop and implement its ideas. This meant including faculty, campus librarians and Chancellors in the membership, providing resources for staff, and delegating actual planning authority to it. The basic premises of the new committee were the same recommendations it had formulated in its first incarnation, and they pointed to the directions in which the system itself and its operating policies would change. The old Library Council continued to meet, but from this point on it was no longer a source of library policy. Thus the new Steering Committee contained the restructuring of the library system through replacement of the premises, participants and authority of the old one.

This provisional restructuring was not, however, accomplished by simple presidential fiat alone. It moved library planning from a de facto campus base to a central one and capitalized on centralizing pressures that worked in favor of systemwide cooperation against the success of single campus efforts. First among these was the concern of the smaller campuses that they be assured adequate acquisitions. The faculty were also becoming concerned that book and journal acquisitions were too low. But other internal processes were at work as well.

Despite the declining acquisition rate, new books were still being added to collections and space for them was becoming an important issue on several campuses. For example, Berkeley was acquiring 120,000 more books a year than it could accommodate on its own shelves. One obvious solution was to build new space. But authorization for capital

expenditures required systemwide approval on the basis of a long range campus plan. In effect, systemwide could -- and let it be known that it would -- veto individual campus plans for new libraries until it had a library plan for the whole system. Second, two of the most influential members of the Library Task Force and later Steering Committee became the next President and Academic Vice President of the university in 1975. Whether this was coincidence or whether it reflected the importance of library issues for the system as a whole in the early 1970s, it did have the effect of insuring the continuity and priority of the Task Force's efforts through the critical implementation period of the later 1970s. Last, it should be noted that the systemwide position in favor of a new central plan was also responsive to and supported by the very strong environmental pressures to control and justify expenditures, in particular, rising costs and the position taken by the State towards library acquisitions.

One of the first things the new steering committee did was to create a strong new staff unit in the central administration to draft and implement a detailed library plan. After a national search, they hired a person from outside the university with experience in both library planning and several multicampus university systems to become the first executive director of library planning for the UC system. Support for the new library planning office came from discretionary funds held by systemwide, soft money, and increases in library postions held back from the campuses.

From 1974 to 1976 the steering committee and the new director drafted a plan and negotiated its acceptance with the faculty, the campuses and the state in a long, iterative process. Finally a plan was

accepted by the state and by internal constituents as the basis of a restructured library system. This rebuilt system reflected the steering committee's planning guidelines and incorporated the following new elements: 1) structural change from a single-level campus centered system to a hierarchical system with three levels, campus, regional, and systemwide; 2) budget formulas which assumed a more or less stable rate of collection growth based on academic programs and enrollments; and 3) automation of formerly labor intensive processes such as cataloging and circulation. In addition automation provided the network needed to integrate and take advantage of the economies of scale of the new structure. Almost all of the cost savings which resulted from automization and pooling old books, as well as the budget increments won from the state, were spent on restoring the acquisition rate to acceptable levels.

During the planning period the state continued to restrict library appropriations. Although these actually did increase gradually from year to year, the increases were not sufficient to meet rising costs: the acquisition rate continued to decline. It took a last sharp drop in 1976-77. Then the University began to implement its new library policies. With this the acquisition rate slope reversed itself again and began to climb rapidly. As the new library plan was implemented and then institutionalized, the level of University resources and activity devoted to library planning slowly dropped to a routine level.

Current State and University plans are for maintaining acquisitions at a relatively flat rate around the 1983-84 figure. The rate is now linked to, and should reflect, incremental changes in University enrollments and programs.

In his discussion of artifacts, of "all things in fact that can be regarded as adapted to some situation," Simon shows us that we can "often predict behavior from knowledge of the system's goals and its outer environment, with only minimal assumptions about the inner environment" (Simon, 1981). For organizational systems which can adapt, which are ultrastable, this implies that the environment appears to be the major determinant of the system's behavior. Once we have identified the essential variables which are being threatened in a given instance and the disturbances to them, we do not need to entertain complex descriptions of negotiations, personalities, games or analytic assumptions in order to understand what happens.

In the library case, there is only one variable in the library system which displays the properties of an essential variable (i.e., unusual stability over time, and a lagged inverse association with the level of organizational activity) and that is the book acquisition rate. The importance of acquisitions as the determining variable for response and change in the library system emerges from an examination of its progress over the whole period of the 1970s and beyond, and from a comparison of its levels with the level of library planning activity which occured at the same time. Figure 2 summarizes the changes in the acquisition rate from the time it began to drop in 1970.

One of the most interesting patterns to emerge from the library case study is the remarkable economy of fit between the structure of the organization's response and that of the environmental changes threatening acquisitions which stimulated it. In fact the disturbance to the library system's essential variable appears to be <u>the</u> criteria which determines the selection of the responses which are finally

implemented. Each of the changes in the library system embodied in the final plan is a response to a particular environmental disturbance and the need to restore acquisitions. And there are no other measures in the plan.

It is significant that this result does not appear to have been recognized -- and was certainly not designed -- by any of the actors in the system. Although the planners were aware of the reasons acquisitions were falling, they did not justify elements of the plan in terms of particular disturbances. Instead they organized, justified, and probably thought about them in terms of the functions of the library. For example, the planning document itself is structured in these terms. Chapter headings include "Housing", "Staffing", and "Governance". If the environment had been the organizing principle they might have read something along the line of "Costs", "Enrollments", and "Coordination" instead (UC, 1977). Perhaps more importantly, those elements of the plan which were not necessary to respond to the disturbance, such as the proposal to specialize reference librarians across campuses, were dropped during the process of negotiation and implementation. Table 2 matches the major elements of the new plan with the internal and external constraints which each satisfies.

Reorganizing a Discipline

In 1983 Martin Trow published a study of a different instance of organizational adaptation then in progress in the University of California, which displays some of the same characteristics of the process of change in the UC libraries. This is the reorganization of the biological sciences now being implemented on the Berkeley campus.

Both cases involved approximately the same amount of time, a decade, and similar magnitudes of fiscal resources.

As Trow describes it, developments in the biological sciences were slowly leaving the Berkeley campus far behind. The problem was most conspicuous in the laboratories where old equipment and, even more important, outdated spatial arrangements had been interfering with research for many years. Individual departments attempted to keep up with change by hiring the best faculty they could attract in the most promising new subfields. Laboratories were refurbished for the new appointees. This is an entirely predictable and appropriate department response to change. But now the results were no longer satisfactory.

In a process that is reminiscent of each of the nine campuses' efforts to build a separate comprehensive library, each of the life science departments at Berkeley was attempting to duplicate the entire field of the changing biological sciences. In 1981 an external review of the Berkeley programs remarked on this strategy:

> Single departments have planned their recruitment of faculty members so that, over the years, each became a microcosm of biology. This has led to duplication and the physical separation of faculty members of like interests. In addition, this mode of recruitment can lead to the appointment of individuals whose interests are not highly relevant to the most urgent needs of the teaching and research programs when viewed as a whole (quoted in Trow, 1983).

The review committee linked the departments' response to problems of quality in research and teaching:

> The general reputation of the biological sciences at UC Berkeley has declined over the years because of a failure to develop strong faculty groups in newer subject areas. For example there are a substantial number of neurobiologists on the campus, many with excellent reputations, but the area has not prospered as it might because of difficulties in achieving the proper degree of interaction between faculty members and the fullest development of the graduate program (quoted in Trow, 1983).

Trow wrote that it was the "concern about [laboratory] space which was the driving force for the revitalization of biological research and

teaching at Berkeley." Nevertheless, it was not the deteriorating quality of the facility, nor was it the costs of duplicating subfields of research interest across departments which actually triggered the reorganization. The labs had been substandard for many years, and department policies were a concern only as they affected department quality. Change was the result of evidence that the quality of research and graduate teaching had eroded.

Faculty complaints that recruitment was becoming more difficult and that the reputation of Berkeley programs no longer reflected their formerly high ratings in formal surveys alerted administrators to the problem in the very late 1970s. Their response was to inventory faculty research activity in the biological sciences. Information from this survey revealed discrepancies between the distribution of faculty research interests and the current department structure.

In 1980 internal and external peer reviews of the biological sciences were initiated. Although the timing of such reviews is affected by signs of trouble such as those in the life sciences, they are routinely scheduled every few years by the administration and the Academic Senate, precisely to monitor program quality. Thus the campus had begun to attend to the message of decline when the evidence became irrefutable with the publication of new national rankings of graduate departments in 1982. These rankings, the first published in twelve years, showed slippage in several of the Berkeley biology departments, particulary those most affected by changes in the field. "They were," writes Trow, "as useful to reform as losing a war."

From Trow's account it appears that the Internal Biology Review Committee functioned similarly to the Library Task Force in providing

the new decision premises needed for change, and in laying the groundwork for a new plan and planning structure. It recommended the establishment of an Advisory Council on the Biological Sciences which would take over the authority of the traditional policy makers (here, the dean and the departments) for the period of change. The Chancellor established such a Council on the Committee's recommendation. The Council's role in the subsequent planning process, as well as its relationship to the old policy makers, is, in turn, parallel to that of the Library Policy Steering Committee which functioned in the library case. Its membership was made up of prominent biologists active in the most important new areas of research. Its powers, formal and de facto together, included allocation of new faculty positions among the schools and departments, specification of subfields within departments for new hiring, and appointment of the search committees which conduct the hiring. And the Council reserved the right to review appointments. All of these powers had traditionally been the province of deans and departments.

The Review Committee also recommended that new laboratory buildings should be organized on the basis of the different levels of organisms studied (e.g. molecular, cellular, population) rather than on the basis of type of organism studied (e.g. zoological, botanical, anatomical), which was the principle of division among the departments. Biologists from different departments would be encouraged to locate their own laboratories in the new facilities in "'affinity groups' -- temporary groups of scientists... working on similar problems and needing similar kinds of laboratory facilities." This recommendation was implemented as the basis for construction and renovation of laboratory facilities.

The review committee's recommendations could be implemented because its members were among the most well respected biologists on the campus. They were, therefore, considered most able to address the campus problem of program quality. The departments, and even the deans, did not individually control sufficient resources, powers or expertise (in other words, premises of decision) to resolve the problem and restore the reputation of biological sciences at Berkeley.

Trow reports that

> The strongest opposition [to the new plan] from within the biological community at Berkeley came from evolutionary biologists and ecologists, who feared that the clear molecular bias of the new seven-person council would hinder proper development of areas of biology concerned with populations rather than biochemical processes at the level of molecule, gene, and cell. Their protests were strong enough to lead the chancellor to add two members to the council during its first year of operation, one an evolutionary biologist, the other an ecologist. While there are still a significant number of biologists who are critical of some aspect or other of the proposed reform, there appears to be broad satisfaction among biologists on campus and a general sense that the overall movement is in the right direction.

Trow's case study provides a second example of environmental change and an old, well-established structure (the departments) which attempts to respond in ways consistent with its normal repertoire. In both the library and the bological sciences cases, the failure of this response finally threatened essential variables (e.g., the reputation of campus programs), and ad hoc review and advisory structures were created which were both sensitive to the environmental changes and which were able to bring new powers and information to bear on the problems. As in the library case, the solution to the problem of biological science at Berkeley involved a comprehensive restructuring of the academic setting, in this case the organization of disciplinary subdivisions within the life sciences, as well as a complementary rearrangement of physical

facilities and relationships among the faculty. In both cases a means of restoring "essential variables" -- acquisitions and program quality -- was discovered de novo as a result of a process of integrating information about the disturbance: those most sensitive to the changes (for example, the prominent biologists in the new subfields, or the externally recruited library experts) supplied the new premises of decision. Thus, in cybernetic terms, the university's capacity to regulate against new environmental "disturbances" was supplemented by new information from the environment itself.

Demographic Change

In the last example, the development of UC's Early Outreach affirmative action programs, demographic changes in the state of California resulted in popular demands to increase minority student access to higher education. These were expressed, in part, by fiscal inducements and pressures put on the university to increase the diversity of its student population.

The administration monitors the flow of resources into the organization (an essential variable) and is sensitive to loss of legislative support and other variables which directly affect this flow. Thus it moved very early to increase special admissions programs (like the Educational Opportunity Program of the early 1970s) and loosen admission standards for minority and other special category students. These can be viewed as normal, predictable administrative responses to change in public demands which affect support.

At the same time, however, the formal admissions requirements were themselves no longer adequate to limit the pool of university eligible students to the top 12% of California high school graduates, a limit

mandated in the state Master Plan for Higher Education and a parameter of the UC system. This was at least partly a result of high school grade inflation, but it presented a real problem to the university.

In the mid-1970s a state study showed that the percentage of UC eligible students had risen to over 14 percent. And the UC faculty was becoming concerned with declining skills among incoming freshmen, the eligibility rate and admission standards, all essential variables which it monitors. As a result the Academic Senate took steps to tighten UC admissions standards in ways that would return the eligibility pool to 12% and would give the schools guidelines for improving student preparation. These steps, however, would also have a disproportionately negative impact on those minority students the administration was trying so hard to attract.

It became clear that the solution to the student affirmative action problem facing the university would have to involve programs for increasing the rate at which minorities become eligible to attend the university rather than the comparatively simple, but "vetoed", means of relaxing the formal standards for minority students.

The Academic Senate recommended changes in admissions that were adopted by the Regents in 1978 in spite of the strenuous objections of top administrators who feared the political effects of appearing to exclude minority students for any reason. At approximately the same time, however, the administration changed the focus of student affirmative action efforts away from easing admissions standards towards programs in targeted public junior and senior high schools designed to increase the number of qualified non-traditional students in the regular admissions pool. These responses did help ease political pressure on

the university to take steps to diversify its student body. And now, in the mid-1980s, they appear to be solving the problem of minority student recruitment, if not eligibility, as well.

Even though the problems of student diversity and preparation have not gone away (in part because they involve the entire state education system), the university's response suggests some interesting conclusions. First, the Master Plan parameter together with Academic Senate actions worked as vetoes on the administration to force the university to seek solutions to demographic change consistent with faculty and Master Plan levels of quality. Second, the fact that the university is only indirectly, rather than directly, controlled by the state made it possible for the UC to use state and other resources to experiment with unproven programs, resulting in successful innovation. Ironically, given the UC's elitist reputation, UC's early outreach programs are still the only ones of their kind undertaken by a public university anywhere in the country.

Implications: Vision, Leadership and Ultrastability

For organization theorists working from the analytic and cognitive paradigms described above, complexity, the proliferation of interests, issues and environmental disturbance, makes it difficult to control or even predict the consequences of organizational action. For these writers, the ambiguity which characterizes the operation of complex organizations, particularly universities, calls the very concept of leadership into question.

In practice two contradictory responses to uncertainty are typical. Those who are most concerned with reducing the uncertainty caused by complex chains of interdependence often seek to increase oversight and

accountability. Others establish or contract with autonomous universities and independent research organizations to generate information about the cause-effect relationships which shape choices and their consequences.

What happens to the concept of leadership when we shift to the cybernetic model developed here? Is it possible to speak of control, leadership, or even management in organizational systems in which regulation is dependent on information from the environment and "decisions" are the product of several subunit interactions?

The answer is that in the cybernetic framework control (regulation) is understood as an emergent property of the whole system, rather than as a separate property of one or more of its parts. That regulation of the value of essential variables against disturbance which is not already a part of the organization's repertoire comes as a response to new information about the relationship between the organization's trials and the value of its threatened variables. More traditional approaches assume that leadership rather than parameter change is the stimulous for change in the organization. The difference between the two approaches is perhaps best illustrated in the analytic and cybernetic interpretations of the biological sciences case.

Trow interprets his case study from an analytic perspective. "Leadership implies the ability to get something done," he writes. "But if there is a consensual wisdom on this ability currently, it is that leadership in higher education, especially leadership of universities, is hardly possible." This is said to be true for reasons stemming from the complex and professional nature of academic work, the diversity of a university's functions and relations to its environment, and from

centralizing trends in the environment that limit institutional autonomy.

Trow sees Berkeley's response to change in the biological sciences as a deviant case of successful leadership which can illustrate conditions under which leadership is possible. Berkeley offers

> "an example of at least one American university where substantial changes have been made and are continuing to be made through a coordinated effort of the organization which has required institutional leadership in the office of the university's chancellor."

He holds that the conditions permitting this instance of successful change are 1) an active campuswide commitment to program quality that was evoked by the problems in the biology departments, 2) an authority and access to resources which allows campus administrators free response to problems, and 3) the personal strengths of the top administrators. For example,

> "For a knowledgeable biologist to be the second senior administrative officer on campus, and the only administrator besides the chancellor himself who had general authority across the whole campus was of the greatest importance throughout these events. But of equal importance, both he and the chancellor are active administrators who tend to initiate events and programs rather than wait for them to happen."

From the perspective of the cybernetic approach, two of the conditions for leadership which Trow describes and which are consistent with analytic models, consensus and freedom of response, appear to be necessary but not sufficient conditions for change. Surprisingly, the third condition, knowledge, skill, and inspiration on the part of top administrators, may not even be a necessary condition for successful adaptation.

Given a certain shift in the stance of the observor, in the punctuation of events, it may actually be quite difficult to understand

how the chancellor and vice chancellor can be said to have "initiated" reform. Problems with the laboratories had been acute for some time, but no one acted. In addition, the top administrators did not foresee the slippage in department reputations or the bad external reviews. What they did do was respond to strong warnings from the faculty. And their response was an ordinary and appropriate one for UC administrators given the apparent severity of the problem. They appointed internal and external peer review committees and implemented their recommendations. It was the members of these committees, not administrators, who linked some of the problems to current department practices, who indicated the direction of improved response and who provided the scientific justification for reorganization.

Nevertheless, it is also clear from Trow's account that these prominent biologists were not organizational leaders in the traditional sense either. They could not -- and were not called upon -- to secure the necessary support for the large captal expenditures involved in the change, they required the active support of the administration to undertake and implement their recommendations vis-a-vis the deans and departments, and they needed the cooperation of individual faculty who maintained their right to determine the location of their laboratories, the composition of the new 'affinity groups', and, perhaps most important, the choice to work in the Berkeley scientific community.

If we view the reorganization of biological sciences at Berkeley as a case of ultrastable adjustment rather than an unusual case of vision and leadership, we see that the success of this enterprise rests to a greater extent on the structure of the system than on the foresight of individuals or the power and discretion of the leader's office. It is

quite likely that if the campus had not found a way to respond to change when it did, department reputations would have continued to slide, while faculty recruitment and retention would have become increasingly difficult. But because program quality is a variable which is closely monitored by faculty and which is supported by administrators (themselves tenured faculty) and because the aggregate choices of individual scientists to stay or leave the community can veto the status quo and force change, the University eventually restructured its programs in the life sciences. Leadership, "the capacity for getting something done" is a designed characteristic of the university system. This same design capacity is also evident in the library and affirmative action cases.

The cybernetic approach taken here not only defines "leadership" in new and somewhat surprising ways, it also suggests logically consistent solutions to problems for which analytic approaches usually rely on ad hoc answers. For example, why did the campus wait until the late 1970s and early 1980s to respond to changes in major areas of research (and extramural funding) that had been taking place for many years? The answer is not that conditions for leadership suddenly became more favorable at that time, e.g., because a new, more skillful chancellor was appointed, or discovered new resources, authority and/or a way to resolve longstanding conflict over the relative importance of quality in campus programs. This is the kind of answer that would be consistent with a leadership approach, but it is not what happened (even though a new chancellor was appointed internally after the campus had begun to respond to the problem). The campus acted when it did because the quality and reputation of a whole division of departments, an essential

variable, had begun to decline. News of this decline was transmitted through formal and informal soundings of the larger community of biologists and through the increased difficulty the campus experienced in recruiting and retaining faculty of choice.

The difference between ultrastability and vision as explanations for successful change also sheds light on the validity and limitations of the cognitive theorist's scepticism about the possibility of rationality in organizations. March and his colleagues explain the appearance of individual leadership in universities as a chimera, an artifact of the cognitive structuring which we employ to order situations that would otherwise seem to be too ambiguious to permit action. They then lead us to the conclusion that in the absence of individual leadership we are left with "organized anarchy".

The cybernetic approach permits us a similar scepticism about the individual's or the individual decision unit's control over organizational outcomes (here the value of essential variables) because these are seen as the conjuction of environmental parameters, the operation of a veto unit in the organization, and a successful organizational response. And when the environmental disturbance is unprecedented, a satisfactory response may be as likely to result from a random series of trials and errors as it is from a caluclated series of trials and errors.

Nevertheless ultrastability does not abandon us to anarchy. The success of regulation is defined in terms of the values of a limited number of essential variables which the ultrastable organization protects in ways which may not be immediately apparent to individual participants, including top administrators. Thus the organization's

behavior may appear random at the subunit level of indidviduals, groups, and coalitions, but it is neither random nor unpredictable with respect to the values of the essential variables and the environmental conditions that affect them.

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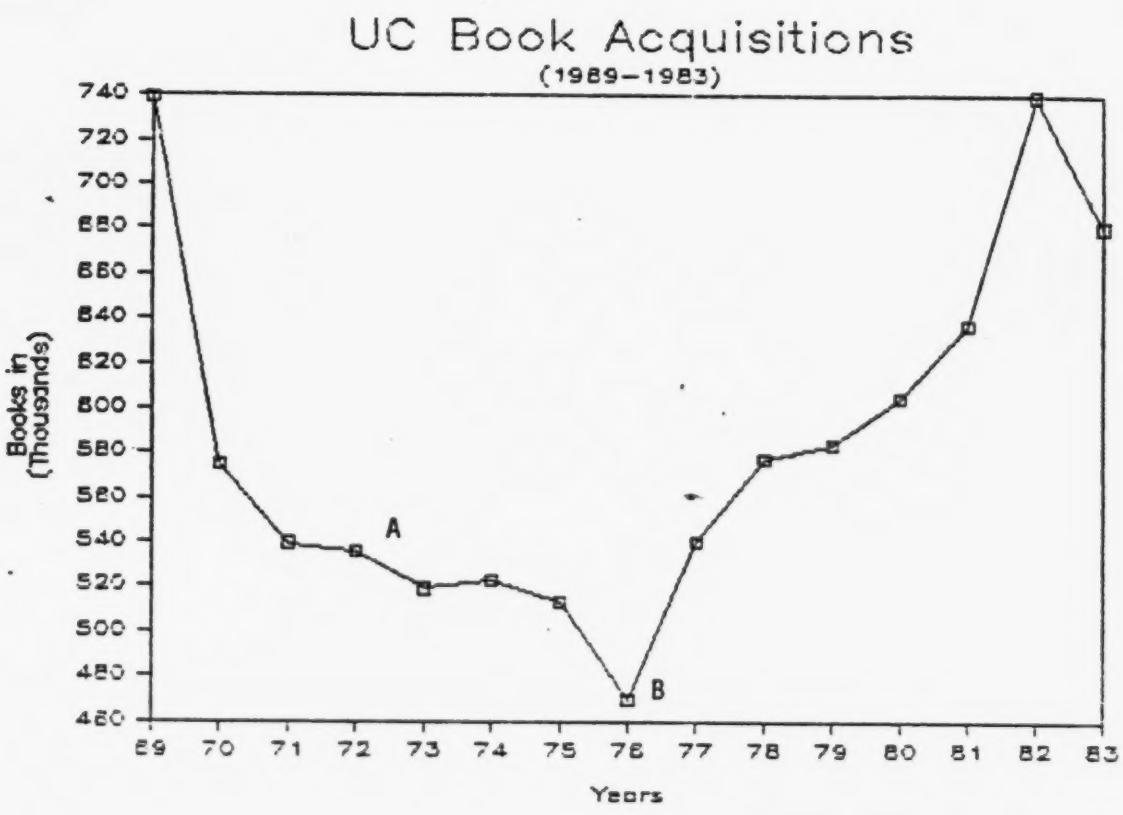
Table 1

Summary of Models of Organizational Change
and Their Empirical Correlates

Model	Process of Change	Behavior When Environment Changes	Other Empirical Correlates
ANALYTIC	Rational Choice	Consistent with organizational goals and environmental conditions	Prior, stable goals and preferences; Consistency (e.g., between plans, budgets, and behavior) Means-ends analysis (rationality)
-bureaucratic	programmed; recalculation	recalculation, or externally imposed redesign	
-political	brokering, bargaining, conflict resolution,	environment affects distribuion of influence in organization, which affects decisions of dominant coalition	leadership, dominant coalition, interest aggregation, e.g., logrolling
COGNITIVE	Cognitive or Cultural Structuring	Random: no consistency with either organizational goals or with environment	March-type hypotheses about types of decision making under conditions of load and scarcity
CYBERNETIC	Variation, Selection, Retention		
-simple	programmed homeostatic selection	programmed responses or calculations	
-adaptive	self-regulation through trial and error	IF essential variables change, then an internal veto unit stimulates trial restructurings of organizational responses until essential variables stabilize at satisfactory levels.	Value of essential variables pre-conditions organizational change. Org. behavior = f(eVars, env. disturbance)

Figure 2



Source: California, State of, (1969,...1985) Governor's Budget.

Point A corresponds to the beginning of university planning efforts.
Point B corresponds to the implementation of the new library plan.

Table 2

Relationship of
Environmental Disturbances and Internal Constraints to
University Responses in Restructuring the UC Library System

Disturbance	Internal Constraint	University Response
State Support Contingent on Planning and Coordination		Establishment of Planning Office.
		Planning Document.
		Integration of Collection (MELVYL).
	Access	Jitney Service
		Improved Interlib. Loans
Cost Increases		Introduction of Hierarchy in the Collection (Regional Facilities)
		Automation of Processing and Circulation
	Acquisitions	Conversion of FTE and Automation Savings to Acquisitions
		Securing Budget Increases From State
Enrollment Decline	Academic Support	Program Budgeting of Acquisitions
Scrutiny of Large Purchases		Pooled Book Fund